connexBOX

Complete In-Vehicle Solution for MOTOTRBO™

Professional Digital Two-Way Radio System

Version 3.1.1

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Section 1 - Before You Start

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Introduction

Thank you for purchasing connexBOX®. An in-vehicle solution designed by NeoTerra® Systems for the Motorola *MOTOTRBO*™ Professional Digital Two-Way Radio System. The products have been designed to accommodate the safe integration into fleets and similar fixed locations that use *MOTOTRBO*™ products. The product has store and forward features that reports on activity captured by various triggers in the device. It also has telematics capabilities, and advanced data compression.

NeoTerra® Systems has worked with the end users to streamline the application and make it simple to install, easy to use and understand.

Before Installing Hardware

The connexBOX® suite of products have been tested and approved for use on Series 1 and 2 *MOTOTRBO*™ radios operating in digital mode. All digital system types are supported. However, there are some considerations to observe during deployment. This applies to both new and existing systems. The following list should be used as a guideline when preparing installation.

Radio network should operate in **one** of either:	
Conventional Mode	
IP Site Connect	
Capacity Plus	
Linked Capacity Plus	
Connect Plus (firmware R1.4 or later)	
Requires the neo**ConneX**® application for GPS and data forward capabilities	
Necessary Programing software has been installed:	
Mototrbo CPS	
connexBOX CPS	
connexBOX Firmware Loader	
Radios have firmware version R1.11.10 or later	
XRT 9000 installed with available data paths(Connect Plus only)	
Option board firmware must have “data packet call” enabled (Connect Plus only)	

non-display radios on Connect-Plus systems will not be able to make use of **all connexBOX XL® functionality due to system restrictions.*

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connexBOX® Applications

All connexBOX® products, will offer a selection of vertical specific applications with each successive firmware release. Currently only 2 customer specific solutions have been tested and released.

- Generic function (telematics, event based reporting, FAST).
- Command Alkon integration for Ready-Mix solutions.

Core Devices

The connexBOX® Core Devices act as the in-vehicle data collection and forward tool. A Core Device is necessary to configure and control all connexBOX® features. These devices will connect directly to the radio and ensure data is being passed from any sensors or input devices, through to the *MOTOTRBO*™ network. The functionality of these core devices can be further enhanced with peripherals and 3rd party sensors.

connexBOX XL®

The connexBOX XL® is the premier connexBOX® product. This device contains the necessary hardware and firmware to enable the full feature set of connexBOX®. It also supports the XD and XR Peripherals.

List of Features:
Telematics
Vehicle Ignition Detect
FAST Protocol
Supports connexBOX® XD
Supports connexBOX® XR
Event Based Reporting
Store and Forward

*Note: In previous releases there was the possibility that the device could lockup if the code crashed. This would not only lock up the device, but potentially the radio as well. This release adds two watchdog timers, a software one set to 10 seconds, and a hardware one set to 18 minutes. This will not prevent the box from crashing, it will however prevent the box from locking up. It will also save pending events to the OOR to avoid data loss.

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connexBOX XLjr®

The connexBOX XLjr® is a more compact variant of the XL with all the same logical features, but no physical ports.

List of Features:
Vehicle Ignition Detect
FAST Protocol
Supports connexBOX® XTjr
Event Based Reporting
Store and Forward

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connexBOX XT®

The connexBOX XT is a stand alone device for status messaging. There are 11 status buttons which are active, plus a 12th "No Status" or "Clear" button. The labeling on the device and the configuration of the server can be user defined to utilize the inputs for any status required by the application. The rugged construction features an aluminum case which has been designed for industrial environments.

List of Features:
Status Messaging
Vehicle Ignition Detect
FAST Protocol
Supports connexBOX® XT
Event Based Reporting
Store and Forward

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Peripherals

Peripherals range from input devices to MDT solutions. These can enhance and add functionality to the core product. 3rd party equipment such as sensors can also be integrated.

connexBOX XTjr®

The connexBOX XTjr is a peripheral that can enhance an existing connexBOX installation wth status messaging capabilities. The XL and XLjr support this device. It allows for a total of 6 statuses in a rugged package.

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connexBOX XD®

connexBOX XD is MDT software to be loaded on any windows mobile tablet with RS232 connectivity. A display is loaded with application specific software and is used to provide information input/output to the driver. 3rd party windows tablets with RS232 connectivity have the potential to serve as an XD. This allows the user to select their own hardware for the interface.

connexBOX XR®

A ruggedized display used in MDT solutions that utilizes RS232 connectivity. This display is loaded with application specific firmware and is used to provide information input/output to the driver.

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Section 2 – Programing

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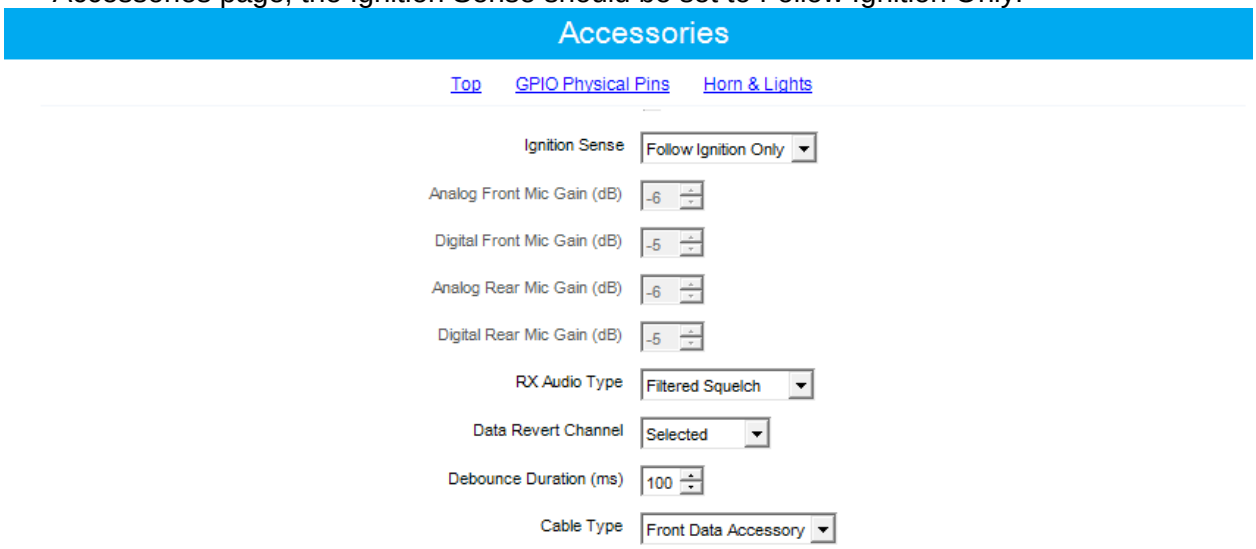
Radio Configuration

This section describes the changes that should be made to the *MOTOTRBO*™ radio configuration using the *MOTOTRBO*™ CPS software. The application guide sections will indicate which changes should be made to the radio configuration.
The CPS application should be put in “Expert” mode enabled (View/Expert) in order for all of the settings to be visible.
The radio dealer is responsible for all other *MOTOTRBO*™ radio configuration settings that are not mentioned in this section (e.g. voice channels, data revert channels, contact lists, etc).

Accessories

- **Rear Data Cable Type:** In the Accessories page, change the Cable Type to Rear Data Accessory. This must be done before attempting to connect the XL to the *MOTOTRBO*™ radio.
- **Ignition Sense:** If the radio power on/off is to be controlled by connexBOX®, then in the Accessories page, the Ignition Sense should be set to Follow Ignition Only.



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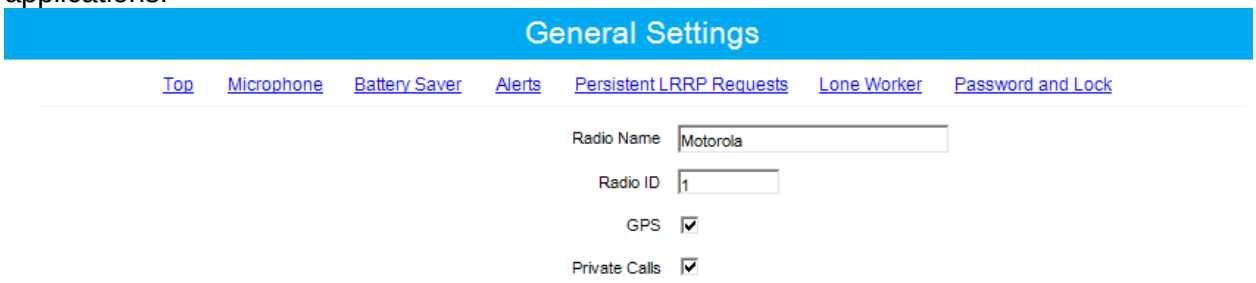
Enable GPS

In the General Settings page, the GPS checkbox must be enabled for any GPS based applications.



Create a Data Revert Channel

It is important that a dedicated data channel be created to pass connexBOX data. This can pass regular GPS data as well, however must ***not*** be Enhanced GPS.

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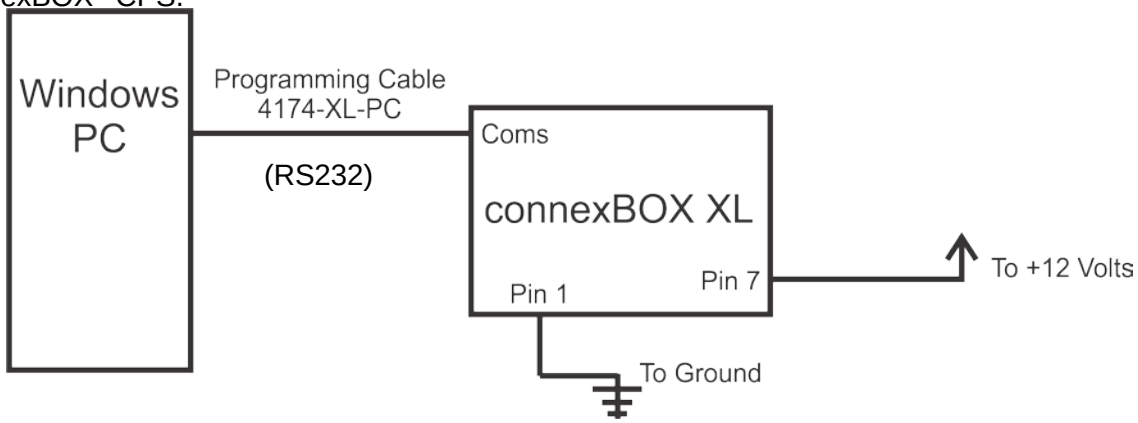
connexBOX® CPS

This section describes the connexBOX® CPS application and how to read and write the settings in a connexBOX. The application guide sections should be followed to understand which settings must be changed.

Hardware Setup – CPS Programming

This figure shows how the connexBOX® XL should be connected to the PC for programming with connexBOX® CPS.



- Ensure Programming cable is plugged from the PC to the Coms port on connexBOX® XL.
- Connect pin 7 to +12 volts DC
- Connect pin 1 to ground

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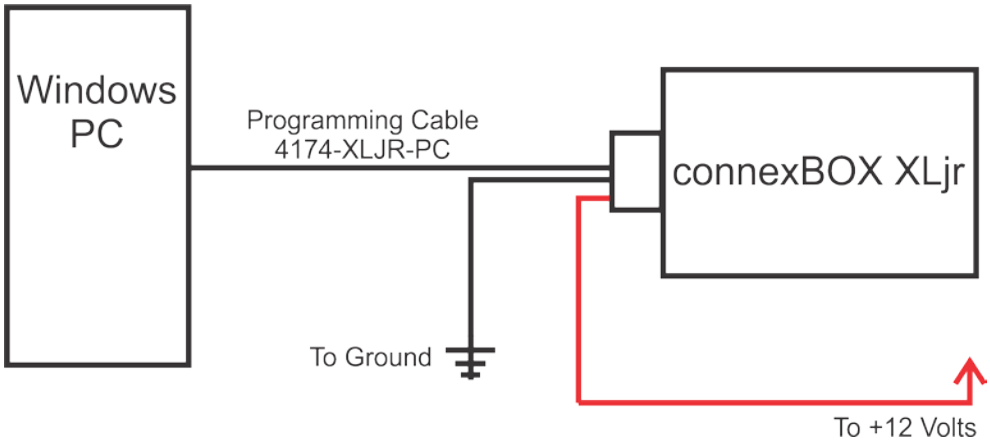
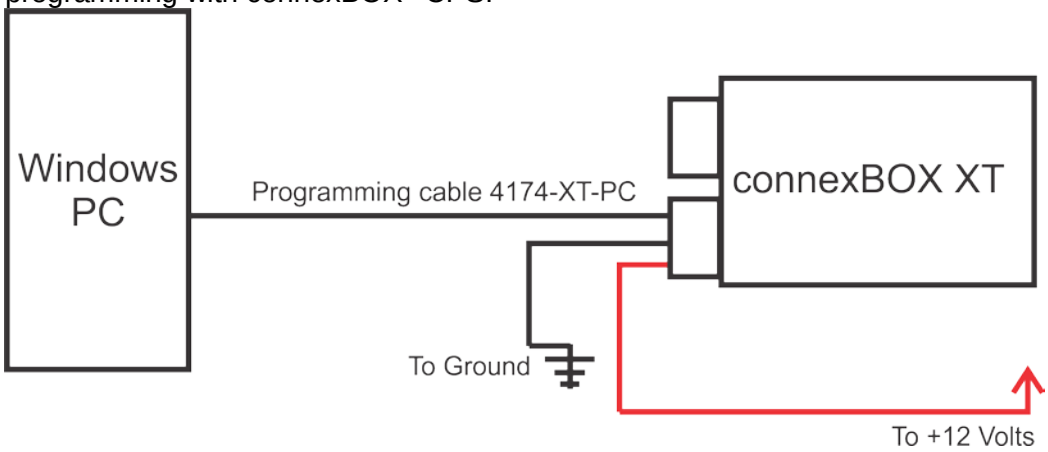
This figure shows how the connexBOX® XLjr should be connected to the PC for programming with connexBOX® CPS.



- Ensure Programming cable is plugged from the PC to the Coms port on connexBOX® XLjr
- Connect red fly-off to +12 volts DC
- Connect black fly-off to ground

This figure shows how the connexBOX® XT should be connected to the PC for programming with connexBOX® CPS.



- Ensure Programming cable is plugged from the PC to the top port on connexBOX® XT
- Connect red fly-off to +12 volts DC
- Connect black fly-off to ground

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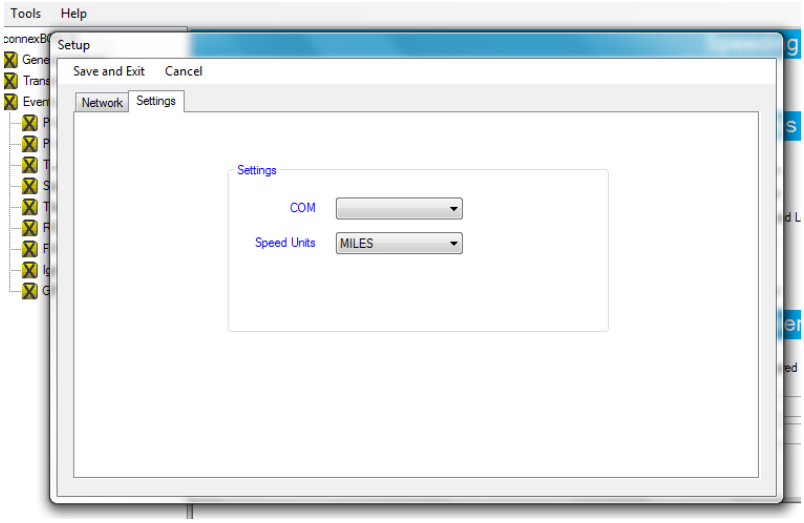
Configuring connexBOX® CPS

- Go to Tools > Settings Network and OTA settings are displayed.
- Click on the Settings Tab.
- You can now adjust units of measurement and which COM port is being read from.



Reading and Writing

With the connexBOX® XL connected to the PC as indicated above, the Read and Write buttons will start the process of reading and writing the settings from the device. These are located along the right side of the application window. Once the settings are read, they are displayed on the application. Displayed settings can then be changed.

- **Open:** Select and open a saved configuration from the Windows PC.
- **Save:** Save the currently displayed configuration to the Windows PC.
- **Read:** Reads and displays the configuration from the device.
- **Write:** Writes the currently displayed configuration into the device.

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Troubleshooting

If connexBOX® CPS is having trouble reading or writing to the XL, check the following:

- The XL programming cable should run from the “Coms” port on the XL to an RS232 (Com) port on the windows PC
- Ensure the correct Com port is selected in CPS. This can be verified by selecting Tools>Settings and navigating to the settings Tab.

Programming connexBOX

You are now ready to change the configuration and write it to the device. The connexBOX has the ability to report GPS, telemetry, and other information to neoConneX, where the data can be presented to an end-user, stored in a database for later reporting, and even sent to 3rd party applications.

The connexBOX® uses smart event based reporting where events can be individually configured to report the desired information. Available events include periodic events, ignition on/off, telemetry, turn reports and speeding.

Utilizing the FAST protocol multiple reports may be bundled together and sent in one transmission. This increases the amount of data being sent to the server without making any change to the amount of bandwidth used.

The availability of reports will depend one which model of connexBOX you are using.

Available Events

The following connexBOX events are configurable settings which notify the device it is time to send data:

- **Dual Periodic** (select 2 separate time based intervals to activate trigger)
- **Turning** (activates trigger on bearing change to send report)
- **Speeding** (activates trigger when configured speed threshold is surpassed)
- **Telemetry Input** (utilizes contact closures to activate triggers)
- **RS232 Pass Through** (used to transfer raw data over TRBO via the “Coms” port)
- **FAST** (proprietary reporting system, capable of GPS location bundling)
- **Ignition** (change behavior of ignition, capable of activating trigger)
- **GPS Fix** (triggers once a minimum GPS confidence has been established)

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Reportable Data

The following data may be included in a report once triggered by an event:

- **Raw Data** (Information from a third party or peripheral device)
- **Latitude and Longitude** (Geographic location of vehicle)
- **Date Time** (Time-stamp to organize reports chronologically)
- **Direction** (Bearing/azimuth that the vehicle is traveling in)
- **Speed** (Speed at which the vehicle is traveling at time of trigger)
- **Telemetry** (information on the current state of contact closures)

Configuring General Settings

- **CAI:** Used to adjust the CAI value to match to your network. Generally this stays at its default 12.
- **Base ID:** The ID of the base station/server which is to receive the data.
- **Port:** The port in which connexBOX data is sent. Generally this stays at its default 1123.
- **System Modes:** Select the type of *MOTOTRBO*™ system the device will be integrated with.

Configuring Transmission

- **Transmission Interval Timer:** Wait time between transmission retries should an acknowledgement not be received.
- **# of Retries:** The amount of retries attempted before pushing information into the OOR queue.

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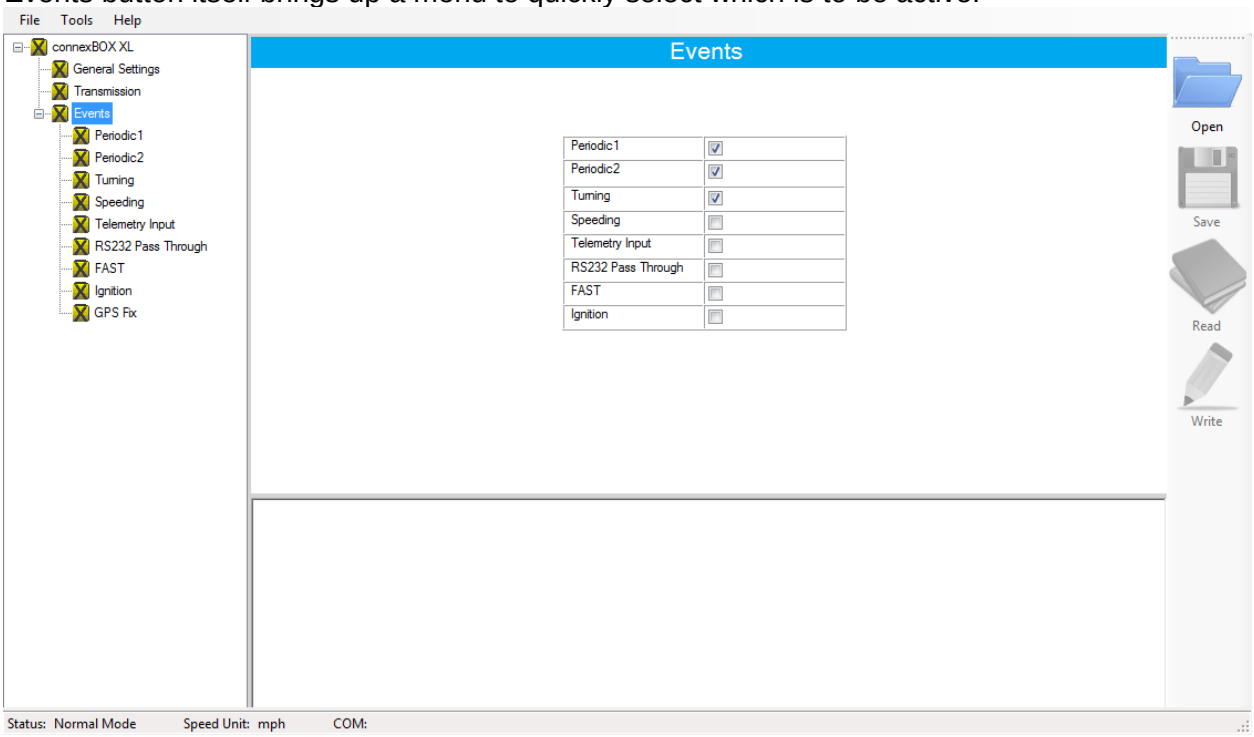
Configuring Events

Maximizing the Events tree, individual events can be selected and configured. Clicking on the Events button itself brings up a menu to quickly select which is to be active.



Configuring Periodics

Periodics allow for basic GPS reports sent at regular intervals regardless of other triggers. These are generally used to keep track of the unit for AVL purposes.

- **Enable:** Select whether or not this feature is to be used
- **Features:** Select the data set you want to send (see, “Reportable data” pg. 20).
- **Parameters:** Defines the trigger to initiate event.
    - **Ack Required:** Verifies the message was sent to server, if not, it tries again.
    - **Reporting Interval:** Select how often the event will trigger

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Configuring Turning Reports

Turning reports allow the device to send a gps report at the moment of a turn. This can help dispatchers see exactly what path was taken by vehicles and track the route more accurately.

- **Enable:** Select whether or not this feature is to be used.
- **Features:** Select the data set you want to send (see, “Reportable data” pg. 20).
- **Parameters:** Defines the trigger to initiate event.
    - **Ack Required:** Verifies the message was sent to server, if not, tries again.
    - **Turning Angle:** Amount of degrees required to change before event is triggered.
    - **Minimum Speed:** The vehicle must be traveling faster than this speed for the event to trigger.
    - **Time Interval:** Once a turn report has triggered, the device will wait this long before another turning report can be valid (to compensate for long, sweeping turns).

Configuring Speeding

Speeding reports allow the device to automatically alert the dispatcher in the event the vehicles speed surpasses a configured threshold.

- **Enable:** Select whether or not this feature is to be used.
- **Features:** Select the data set you want to send (see, “Reportable data” pg. 20).
- **Parameters:** Defines the trigger to initiate event.
    - **Ack Required:** Verifies the message was sent to server, if not, tries again. (This feature is always on in Connect Plus Mode)
    - **Speeding Threshold:** The minimum speed that must be achieved to trigger event.
    - **Hysteresis:** The amount of time the speed just be held before sending data.

Configuring Telemetry Input (connexBOX XL only)

The XL has 3 I/Os, giving you the ability to hook directly into connexBOX. The separate inputs can be monitored with both an on and off state.

- **Enable:** Select whether or not this feature is to be used.
- **Features:** Select the data set you want to send (see, “Reportable data” pg. 20).
- **Parameters:** Defines the trigger to initiate event.
    - **Ack Required** Verifies the message was sent to server, if not, tries again. (This feature is always on in Connect Plus Mode)
    - **Batch enabled** Allows the telemetry triggers to be put into the batch queue.
    - **Trigger Conditions** This allows you to select your triggered (or “on”) condition as either high or low. Additionally, a selection can be made to report on trigger, loss of trigger, or both.

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Configuring RS232 Pass Through (connexBOX XL only)

This feature allows for communication of RS232 devices over the *MOTOTRBO™* system.

- **Enable:** Select whether or not this feature is to be used.
- **Features:** Select the data set you want to send (see, “Reportable data” pg. 20).
- **Parameters:** Defines the trigger to initiate event.
    - **Ack Required:** Verifies the message was sent to server, if not, tries again. (This feature is always on in Connect Plus Mode)
    - **Trigger Conditions:** Will be configurable pending future release. Currently a RS232 device must communicate via the blacksmith protocol (ie, the XD)

Configuring FAST

The FAST protocol allows for bundling of up to 100 GPS reports at 5 second granularity with 2 points of telemetry information. These will be sent at regular intervals as defined by the amount of saved reports.

- **Enable:** Select whether or not this feature is to be used.
- **Features:** Select the data set you want to send (see, “Reportable data” pg. 20).
- **Parameters:** Defines the trigger to initiate event.
    - **Ack Required:** Verifies the message was sent to server, if not, tries again. (This feature is always on in Connect Plus Mode)
    - **Event Count:** The amount of 5 second reports that can be saved before sending. The full 100 will have an interval of 8 minutes and 20 seconds.
        - **Formula: 5_{sec} x A=B**: Where A= number of reports configured per bundle(1-100) and B= interval of transmissions back to neoConneX
        - **Example:** 5_{sec} x 100= 8_{min} 20_{sec}

Configuring Ignition

The Ignition feature allows the radio power to be controlled by the vehicles ignition line.

- **Enable:** Select whether or not this feature is to be used.
- **Features:** Select the data set you want to send (see, “Reportable data” pg. 20).
- **Parameters:** Defines the trigger to initiate event.
    - **Ack Required:** Verifies the message was sent to server, if not, tries again. (This feature is always on in Connect Plus Mode)
    - **Ignition Control Enable:** This option configures whether the radio is deriving its on/off status from the ignition line.
    - **Radio Off Delay:** defines how long the radio will stay on after the vehicle is powered down.

*On shutdown, remaining reports in the OTA queue, the F.A.S.T. queue and the batch queue are moved into OOR queue. In order to send remaining reports on shutdown, ensure that the radio off delay is at least 60 seconds.

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Configuring GPS Fix

This feature triggers a report when a minimum GPS confidence level has been established.

- **Enable:** Select whether or not this feature is to be used.
- **Features:** Select the data set you want to send (see, “Reportable data” pg. 20).
- **Parameters:** Defines the trigger to initiate event.
    - **Ack Required:** Verifies the message was sent to server, if not, it tries again. (This feature is always on in Connect Plus Mode)
    - **Minimum Confidence:** This sets the value of the threshold that will activate the event

Configuring Batching

Defines how often Batches of data are sent to the server.

- **Batch Count:** the amount of reports sent per OTA transmission. This is currently locked to its max value; 10.
- **Batch Send Interval:** time between attempting to send batch. (Max: 120 minutes)

Configuring Out Of Range

The connexBOX device has the ability to store reports when outside of radio coverage and send these as batched reports to the server when back within range.

- **Age Limit:** Total time a GPS report will be saved prior to deletion. (Max: 14 days/Min: 5 minutes)
- **Out of Range Send Interval:** time between attempting to send batch.(Max: 120 minutes)

*****reports overflowing from the OTA queue will also be moved here.

Testing

Testing should be done by forcing an event condition to trigger and viewing the report in neoConneX when the transmission has completed.

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Section 3 - Installation

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Setup

The goal of this document is to aid the reader in installing and configuring the connexBOX® products. Before starting, the necessary PC software should be installed as per the “Before Installing Hardware” checklist on page 5. The appropriate installation section should be followed (dependant on product and required features). After completing the installation steps, connexBOX® will be configured for use. The connexBOX® CPS section describes how to read and write the configuration for the devices. The suitable application guide section(s) should then be followed. These sections describe the applications in greater detail and what configuration settings should be changed in the connexBOX® products and the *MOTOTBRO*™ radios.

connexBOX® XL Installation

Radio Preparation

The *MOTOTBRO*™ radio must be running R1.11.10 (or later) firmware. For Connect Plus systems, the Connect Plus firmware must be R 1.4 (or later). Before proceeding to the next steps, the radio configuration must be updated to set the rear data cable type in CPS (see “Radio Configuration” pg 16).

Connections

From left to right:

- **Enet:** Ethernet connectivity to the device.
- **USB:** This is the USB interface for communication to the radio.
- **Coms:** This contains the connections for RS232 connectivity.
- **Stat:** Indicates the current status of device.
- **Pwr/IO:** Is used to connect the various triggers and receive power from the unit.

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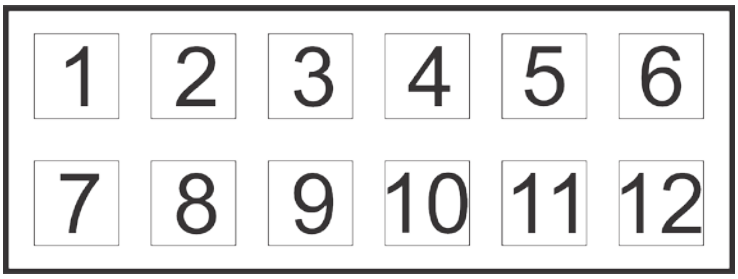
The Pwr/IO block provides these connections:

Pin	Description
1	Ground
2	Output 1
3	Output 2
4	Ignition
5	CANbus Hi
6	CANbus LO
7	PWR IN
8	Input 1
9	Input 2
10	Input 3
11	Analog 1
12	Analog 2



All wires connected to this block should have minimum gauge of 18 AWG or a maximum gauge of 16 AWG. The block should be connected to the vehicle as follows:

- Connect Ground to pin 1 on the connexBOX® PWR/IO block.
- Connect a fused 12V to pin 7 on the connexBOX® PWR/IO block.
- Connect the vehicle's switched ignition input line to pin 4 on the connexBOX® PWR/IO block. The ignition line on the connexBOX® must be pulled high to power up the device.
- The remaining terminals only need to be connected if you are sensing inputs for IO based telemetry events (e.g. door opening).

Digital Inputs

The connexBOX® XL provides 3 general purpose inputs for monitoring events (e.g. a door opening and closing). These are the 8, 9 and 10 pins on the Power Connector. These inputs can withstand a range of 0-12 volts.

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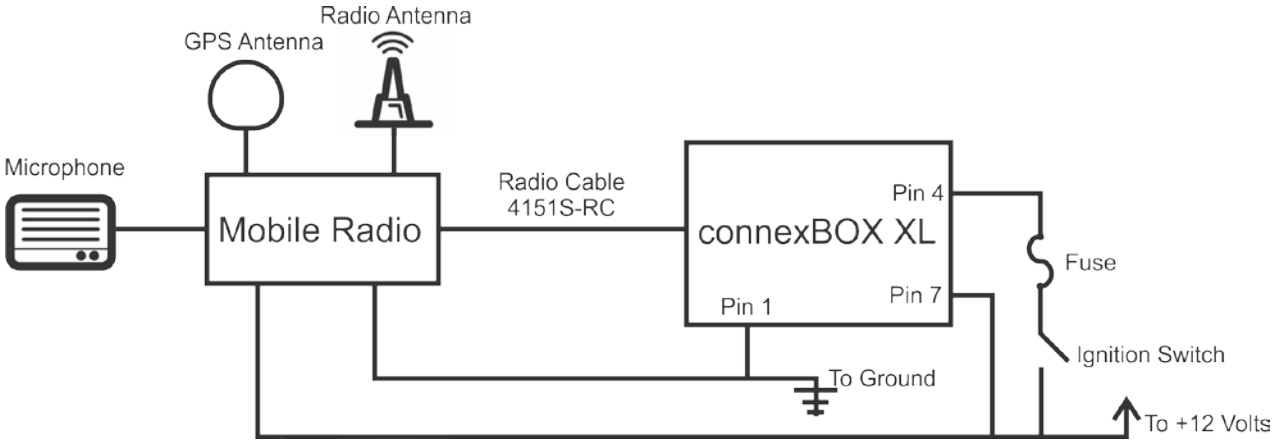
Ignition Sense

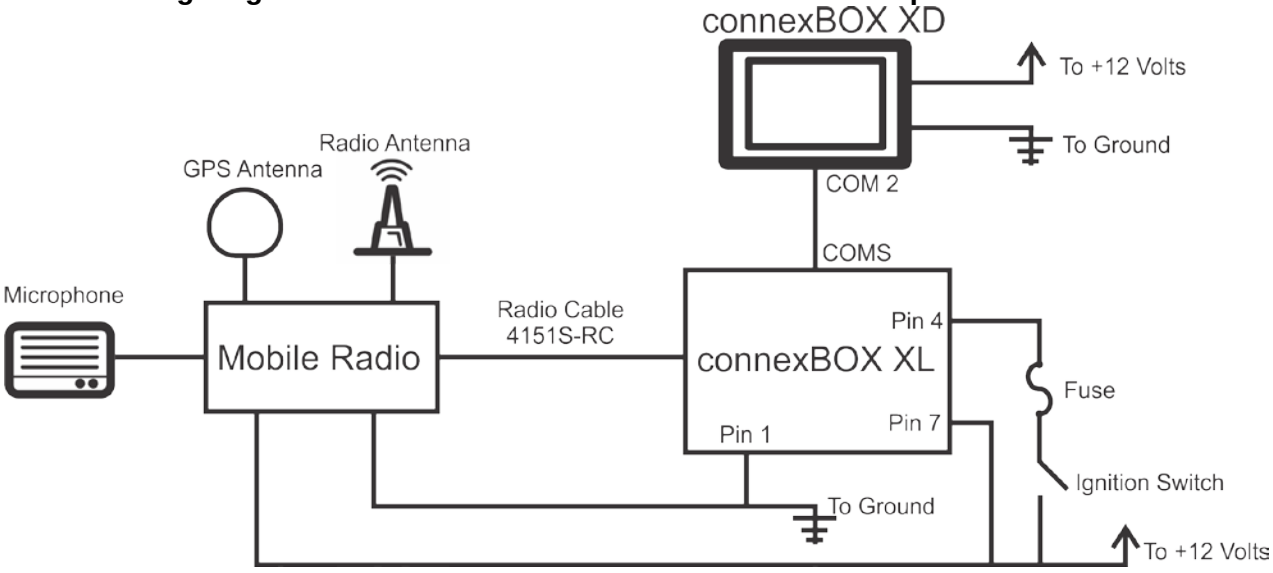
To take advantage of our power control capabilities, the connexBOX® XL should be powered directly from the vehicle's battery with the ignition line from the vehicle connected to the connexBOX® ignition input.
The device provides a Time-OFF timer signal to the radio input "Ignition Sense". When the ignition is turned off the connexBOX® XL will remain powered until it completes an orderly shutdown at which time the device will turn the radio and itself off, thereby preserving battery power.

Interconnection

The following diagram outlines the recommended in-vehicle setup for the XL



The following diagram outlines the recommended in-vehicle setup for the XL with XD



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Antenna and Device Placement

The connexBOX® XL gets its GPS information from the GPS integrated in the *MOTOTRBO*™ radio. For best results position the GPS antenna on the vehicle roof with a clear view of the sky. For optimum performance allow a 4 inch (10 cm) radius metallic ground plane, however if a metallic ground plane is not available the GPS antenna is sensitive enough to operate without a ground plane.
The connexBOX® XL must be installed within 18 inches of the radio so that radio cable connection can be made. When installing any connexBOX® equipment the following safety concerns must be observed:

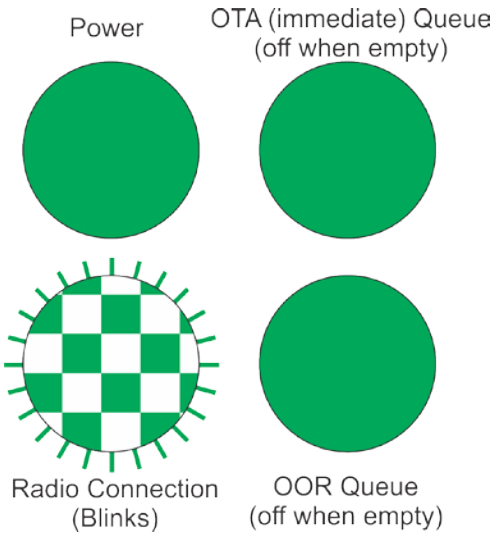
- Placement of components must not impede driver visibility nor render the vehicle unsafe to operate.
- Ensure equipment placements and cable/wire routes do not impede vehicle air bag deployment.

Verifying Connection to the MOTOTRBO radio

It is important to test that the connexBOX® XL is successfully communicating with the *MOTOTRBO*™ radio before proceeding to the next sections. Power should be applied to the *MOTOTRBO*™ radio and the connexBOX® XL. The Device should be connected to the *MOTOTRBO*™ radio with the radio cable (part 4151S-RC).

LEDs

The grouping of 4 LEDs on the connexBOX XL® is used to display status of the device. This diagram explains the function of each light. These can be used to help diagnose any connection issues.



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Troubleshooting

Common reasons for not connecting:

- The radio's rear port was not configured for rear data (See radio configuration, pg 16).
- The radio has out of date firmware. (Recommend R1.11.10 or later.)
- Make sure the radio cable is connected to the "USB" port on the connexBOX® XL.
- In order for F.A.S.T. Reporting to commence, a valid GPS lock must be obtained
- Must have "Data Packet Call" enabled in the option board for Connect Plus systems
- Must have version connect plus firmware 1.4 or later (on connect plus systems)

connexBOX® XLjr Installation

Radio Preparation

The *MOTOTBRO*™ radio must be running R1.11.10 (or later) firmware. For Connect Plus systems, the Connect Plus firmware must be R 1.4 (or later). Before proceeding to the next steps, the radio configuration must be updated to set the rear data cable type in CPS (see "Radio Configuration").

Connections

The connexBOX XLjr has a single connection on the device. This utilizes the XLjr Radio cable (41755-RC) to provide interconnection to the radio, power, and ignition sense. This connection is also used for configuration and firmware loading with the appropriate cable.

Digital Inputs

The connexBOX XLjr does not have digital inputs, however can make use of the 5 on the rear of the MOTOTRBO™ mobile radio. The corresponding pins on the radio cable's MAP connector are left empty to allow this connection, and additional pins are provided. Refer to the "Radio Configuration" and "connexBOX CPS" sections for more info on how to configure these.

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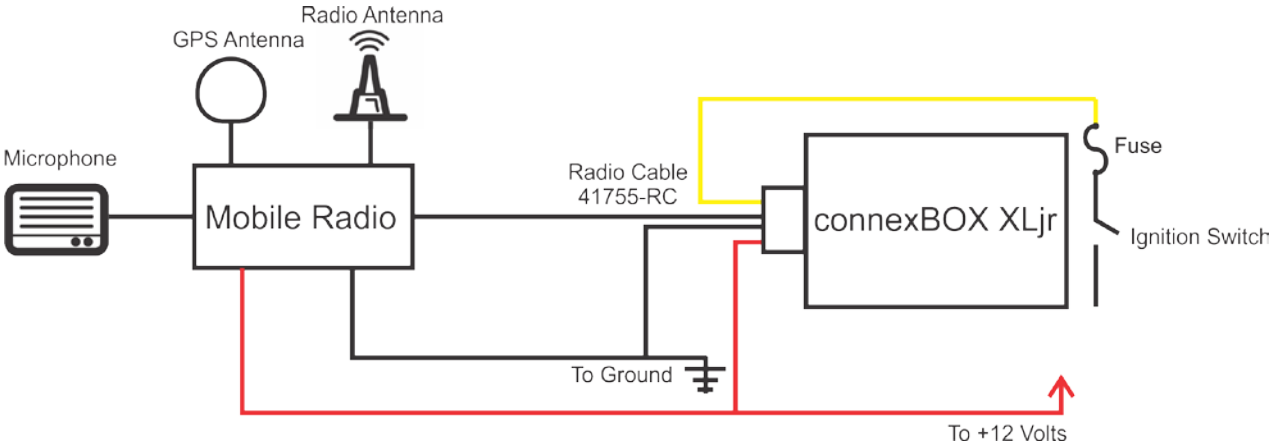
Ignition Sense

To take advantage of our power control capabilities, the connexBOX® XLjr should be powered directly from the vehicle's battery with the ignition line from the vehicle connected to the connexBOX® ignition input.
The device provides a Time-OFF timer signal to the radio input "Ignition Sense". When the ignition is turned off the connexBOX® XLjr will remain powered until it completes an orderly shutdown at which time the device will turn the radio and itself off, thereby preserving battery power.

Interconnection

The following diagram outlines the recommended in-vehicle setup for the XLjr



Antenna and Device Placement

The connexBOX® XLjr gets its GPS information from the GPS integrated in the *MOTOTRBO*™ radio. For best results position the GPS antenna on the vehicle roof with a clear view of the sky. For optimum performance allow a 4 inch (10 cm) radius metallic ground plane, however if a metallic ground plane is not available the GPS antenna is sensitive enough to operate without a ground plane.
The connexBOX® XjrL must be installed within 18 inches of the radio so that radio cable connection can be made. When installing any connexBOX® equipment the following safety concerns must be observed:

- Placement of components must not impede driver visibility nor render the vehicle unsafe to operate.
- Ensure equipment placements and cable/wire routes do not impede vehicle air bag deployment.

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Verifying Connection to the MOTOTRBO radio

It is important to test that the connexBOX® XLjr is successfully communicating with the *MOTOTRBO*™ radio before proceeding to the next sections. Power should be applied to the *MOTOTRBO*™ radio and the connexBOX® XLjr. The device should be connected to the *MOTOTRBO*™ radio with the radio cable (part 41755-RC).

Troubleshooting

Common reasons for not connecting:

- The radio's rear port was not configured for rear data (See radio configuration, pg 16).
- The radio has out of date firmware. (Recommend R1.11.10 or later.)
- Make sure the radio cable is seated and fly-offs are properly connected
- In order for F.A.S.T. Reporting to commence, a valid GPS lock must be obtained
- Must have "Data Packet Call" enabled in the option board for Connect Plus systems
- Must have version connect plus firmware 1.4 or later (on connect plus systems)

connexBOX® XT Installation

Radio Preparation

The *MOTOTBRO*™ radio must be running R1.11.10 (or later) firmware. For Connect Plus systems, the Connect Plus firmware must be R 1.4 (or later). Before proceeding to the next steps, the radio configuration must be updated to set the rear data cable type in CPS (see "Radio Configuration").

Connections

The connexBOX XT features dual connections for power and radio interconnection. The power cable also serves as ignition detection. The radio connection on the connexBOX XT is female, whilst the power connection on the XT is male. These connections correspond to the XT radio interconnection cable (4178S-XT) and the XT power cable (4176-XT-PW). The XT power cable features a black fly-of for ground, a red fly-off for power and white fly-off for ignition sense. A piece of yellow shrink-wrap is supplied with every cable; optionally you can use it to color code the ignition line for the sake of standardization.

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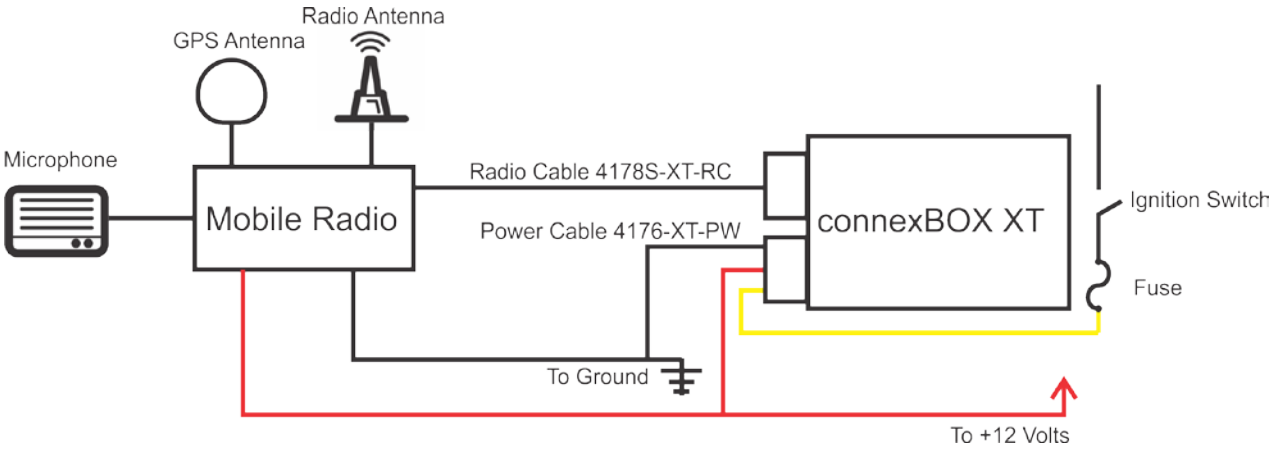
Ignition Sense

To take advantage of our power control capabilities, the connexBOX® XLT should be powered directly from the vehicle's battery with the ignition line from the vehicle connected to the connexBOX® ignition input.
The device provides a Time-OFF timer signal to the radio input "Ignition Sense". When the ignition is turned off the connexBOX® XLT will remain powered until it completes an orderly shutdown at which time the device will turn the radio and itself off, thereby preserving battery power.

Interconnection

The following diagram outlines the recommended in-vehicle setup for the XT



conceptualized with shrink wrapped ignition line

Antenna and Device Placement

The connexBOX® XLT gets its GPS information from the GPS integrated in the *MOTOTRBO*™ radio. For best results position the GPS antenna on the vehicle roof with a clear view of the sky. For optimum performance allow a 4 inch (10 cm) radius metallic ground plane, however if a metallic ground plane is not available the GPS antenna is sensitive enough to operate without a ground plane.
The connexBOX® XjrL must be installed within 18 inches of the radio so that radio cable connection can be made. When installing any connexBOX® equipment the following safety concerns must be observed:

- Placement of components must not impede driver visibility nor render the vehicle unsafe to operate.
- Ensure equipment placements and cable/wire routes do not impede vehicle air bag deployment.

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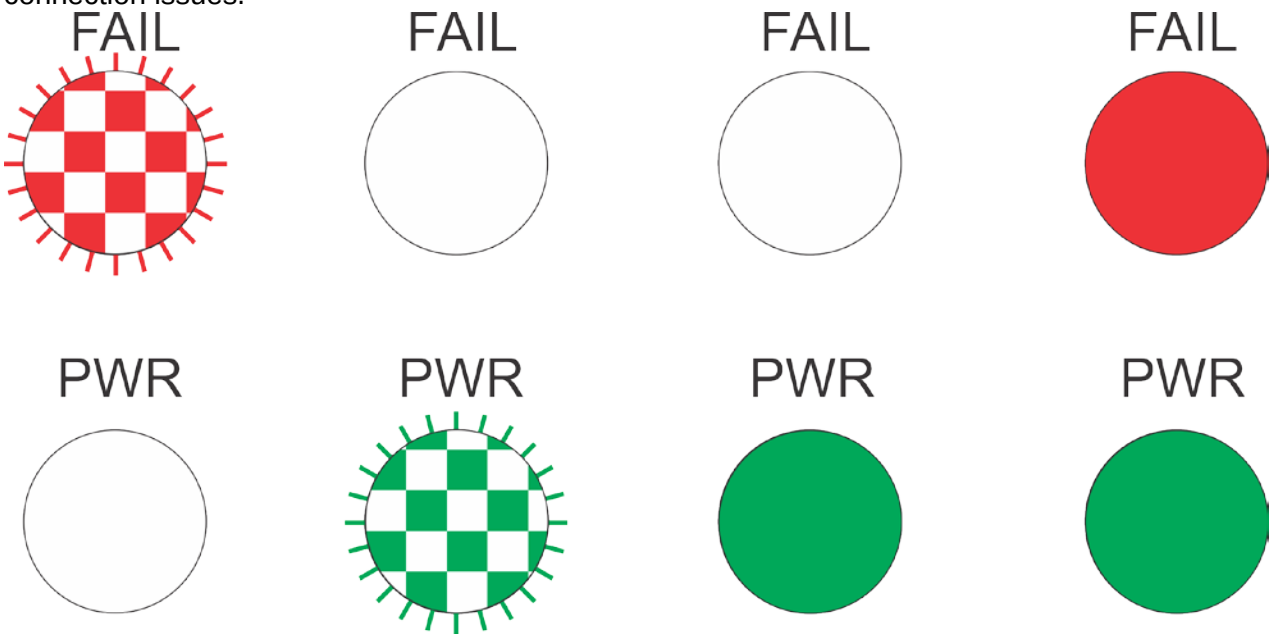
Verifying Connection to the MOTOTRBO radio

It is important to test that the connexBOX® XT is successfully communicating with the *MOTOTRBO*™ radio before proceeding to the next sections. Power should be applied to the *MOTOTRBO*™ radio and the connexBOX® XT. The Device should be connected to the *MOTOTRBO*™ radio with the radio cable (part 4151S-RC).

LEDs

The 2 LEDs on the bottom right corner of the connexBOX® XT is used to display status of the device. This diagram explains the function of each light. These can be used to help diagnose any connection issues.



From left to right

- **FAIL light blinking**: Device is readying itself (should be the first thing you see on startup)
- **PWR light blinking**: Device is trying to connect to the radio (should be the second indication you see after startup)
- **PWR light solid**: Device is now ready (this should be the “regular” state of the XT)
- **FAIL light solid**: The device has attempted to send a status, however, no acknowledgment was received. (the device will revert to its last confirmed status)

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Troubleshooting

Common reasons for not connecting:

- The radio's rear port was not configured for rear data (See radio configuration, pg 16).
- The radio has out of date firmware. (Recommend R1.11.10 or later).
- Make sure the radio cable is seated and fly-offs are properly connected.
- In order for F.A.S.T. Reporting to commence, a valid GPS lock must be obtained.
- Must have "Data Packet Call" enabled in the option board for Connect Plus systems.
- Must have version connect plus firmware 1.4 or later (on connect plus systems).

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Section 4 – Firmware updates

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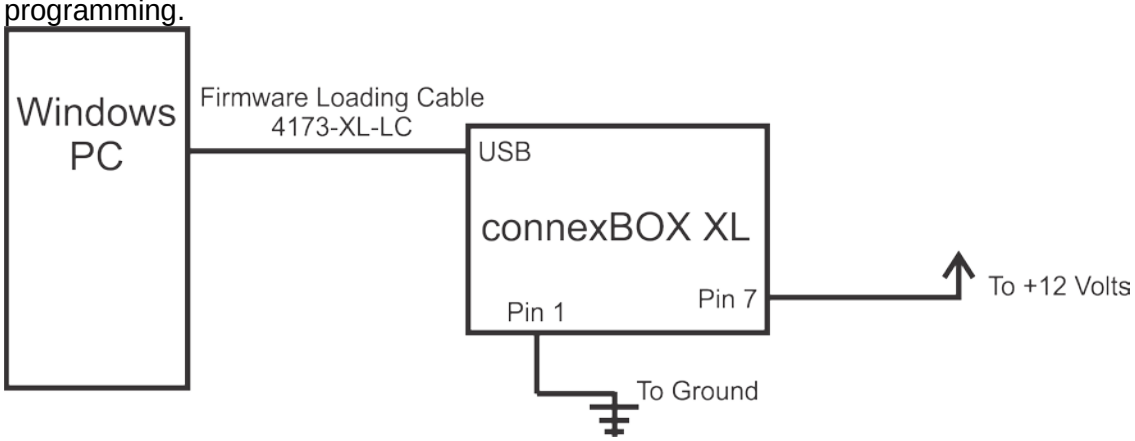
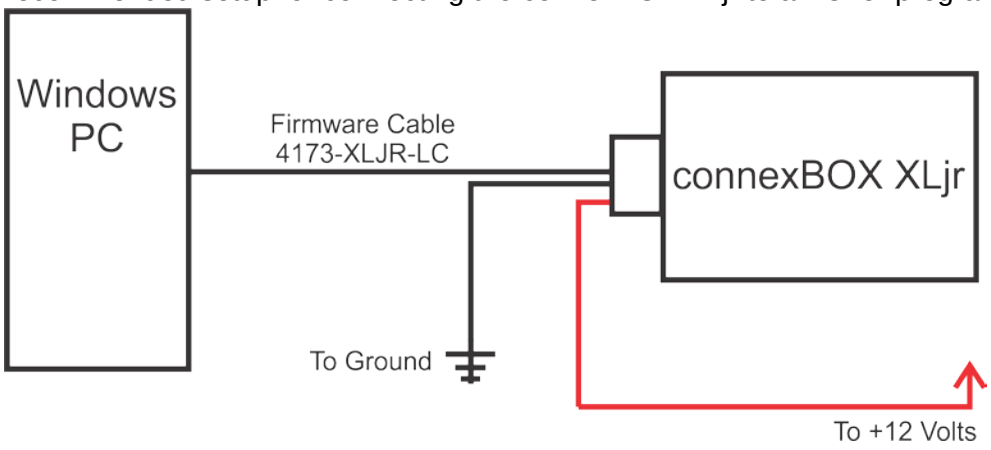
Hardware Setup - Firmware update

As new features are developed, NeoTerra will periodically release firmware updates. This section of the manual will explain how to hook up the device to update and write in the new firmware.

This is the recommended setup for connecting the connexBOX XL to a PC for programming.



This is the recommended setup for connecting the connexBOX XLjr to a PC for programming.



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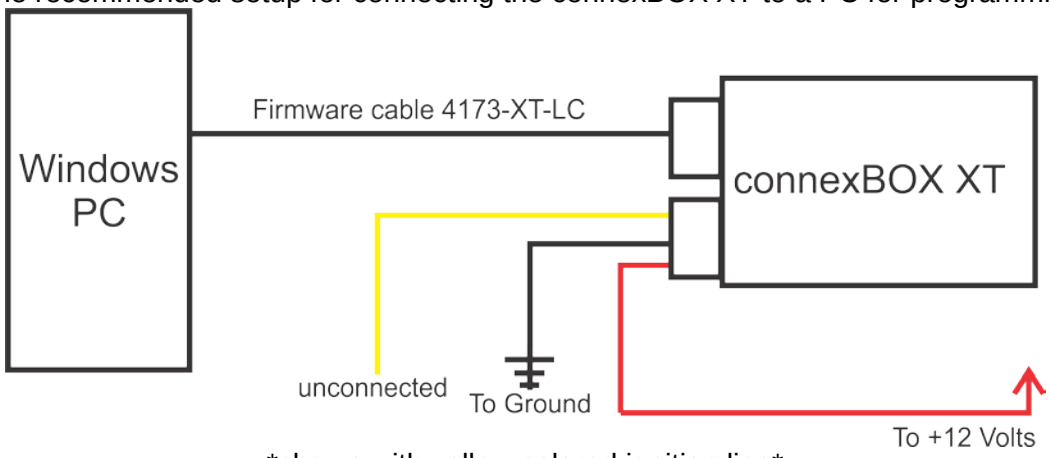
This is the recommended setup for connecting the connexBOX XT to a PC for programming.



shown with yellow colored ignition line

Performing the Update

1. With the device powered off, plug the firmware cable into the device, then power up the device. Once powered up, plug it into the PC's USB port. You should see a "Microchip Technology Inc. USB HID Bootloader" detected. You should then follow the steps provided.
    a. Open connexBOX XL Firmware Tool.
    b. Connect the firmware cable to the USB labeled Ethernet port and plug the USB into the computer, then plug in the power.
    c. Click on Connect, and then Select Firmware. Choose the newest version release and click Open.
    d. Click Update Firmware.
    e. After verification is successful, click Disconnect.

You should now be able to disconnect the device, as it is ready to be configured.

WARNING: Codeplugs are not compatible between firmware versions. You must now use CPS to load a codeplug appropriate for the firmware version you have just installed. You must use a codeplug appropriate for the firmware version you have just installed.

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Appendix A

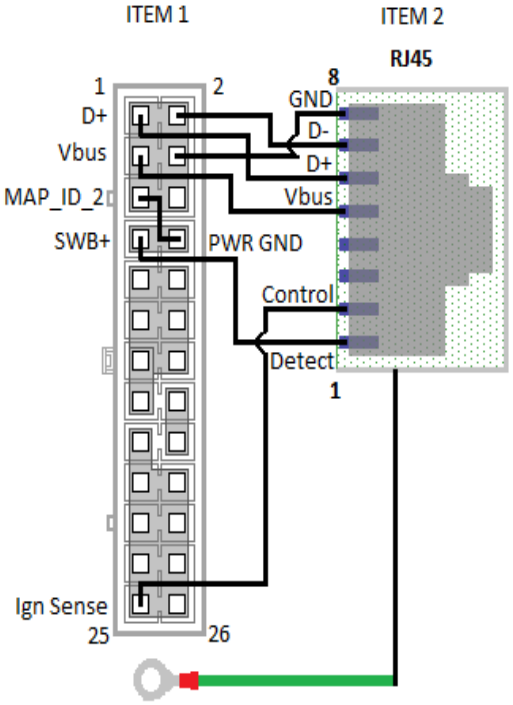
Cable Diagrams

The following is a selection of cable drawings for your reference.

XL-Radio Cable (4151s-RC)

Length: 18 inches

Shielded Cat6 Cable with shielded RJ45 connector to Motorola MAP Connector with DOUBLE wrapped Ferrite cores at either end. Grounding pigtail at the MAP end with lug for grounding to vehicle that is attached to the Cat6 shield that relates to the RJ45 shield.



Wiring Chart			
ITEM 1	ITEM 2	Name in ITEM 1	Name in ITEM 2
1	6	D+	D+
2	7	D–	D–
3	5	VBUS	VBUS
4	8	GND	GND
7	1	SWB+	Radio Detect
25	2	Ignition Sense	Radio Control
5		MAP_ID_2	
8		Power Ground	

- Short pin 5 and 8 in ITEM1
- RJ45 shielded connector is connected with car ground

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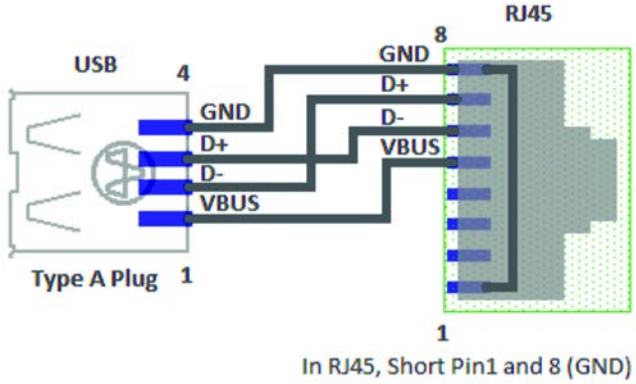
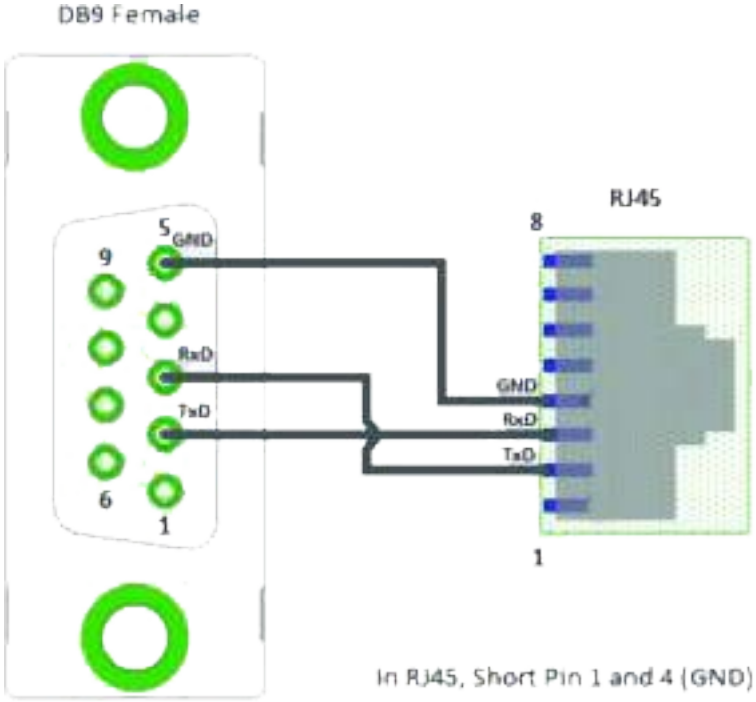
XL Firmware Loading Cable (4173-XL-LC)

Length: 30 inches
USB type cable with USB to RJ45



XL Programming cable (4174-XL-PC)

Length: 30 inches
USB type cable with RJ45 to Serial Female DSUB – DB9



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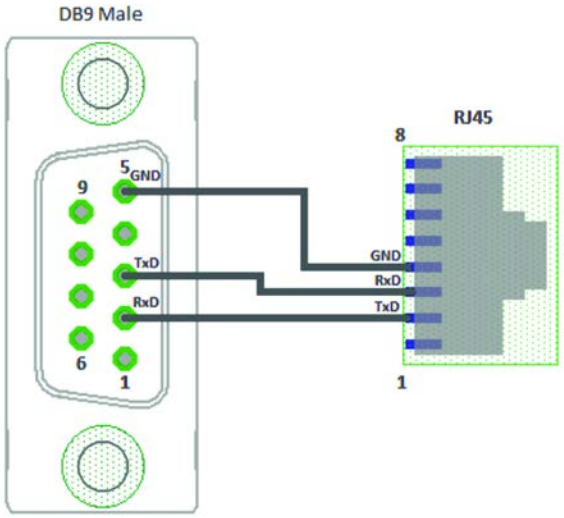
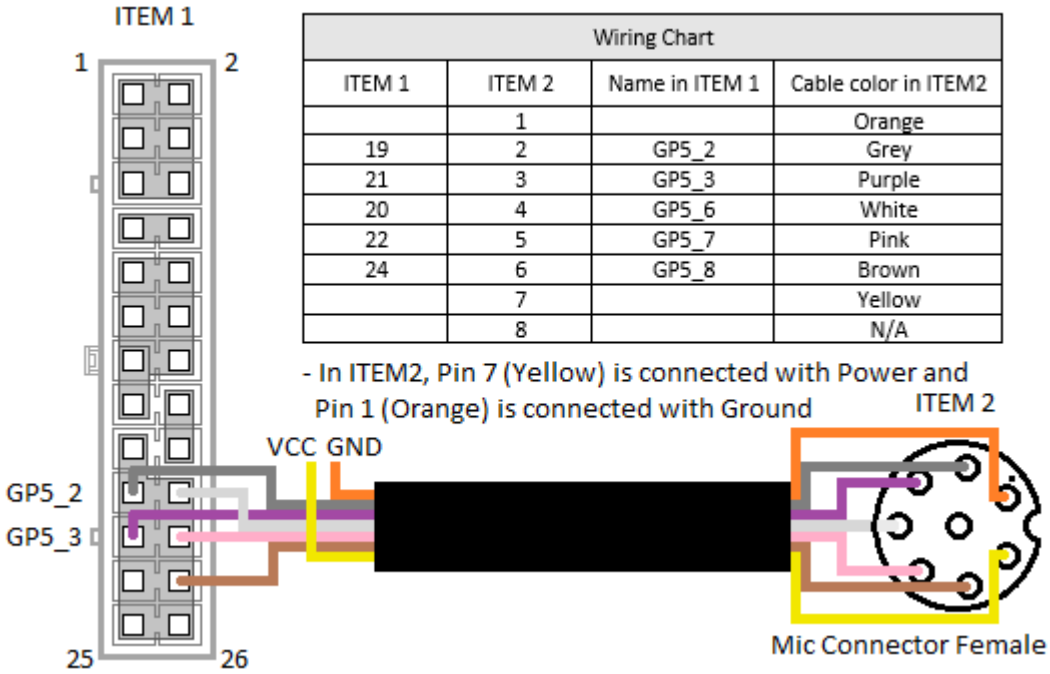
XL RS232 to XD Cable (4175-XL-XD)

Length: 30 inches
USB type cable with RJ45 to Serial Male DSUB – DB9



XT Input Cable (4177-XT-IC)

Female 8 pin connector to MAP with power from radio
Length: 30 inches



Wiring Chart			
ITEM 1	ITEM 2	Name in ITEM 1	Cable color in ITEM2
	1		Orange
19	2	GP5_2	Grey
21	3	GP5_3	Purple
20	4	GP5_6	White
22	5	GP5_7	Pink
24	6	GP5_8	Brown
	7		Yellow
	8		N/A

- In ITEM2, Pin 7 (Yellow) is connected with Power and Pin 1 (Orange) is connected with Ground

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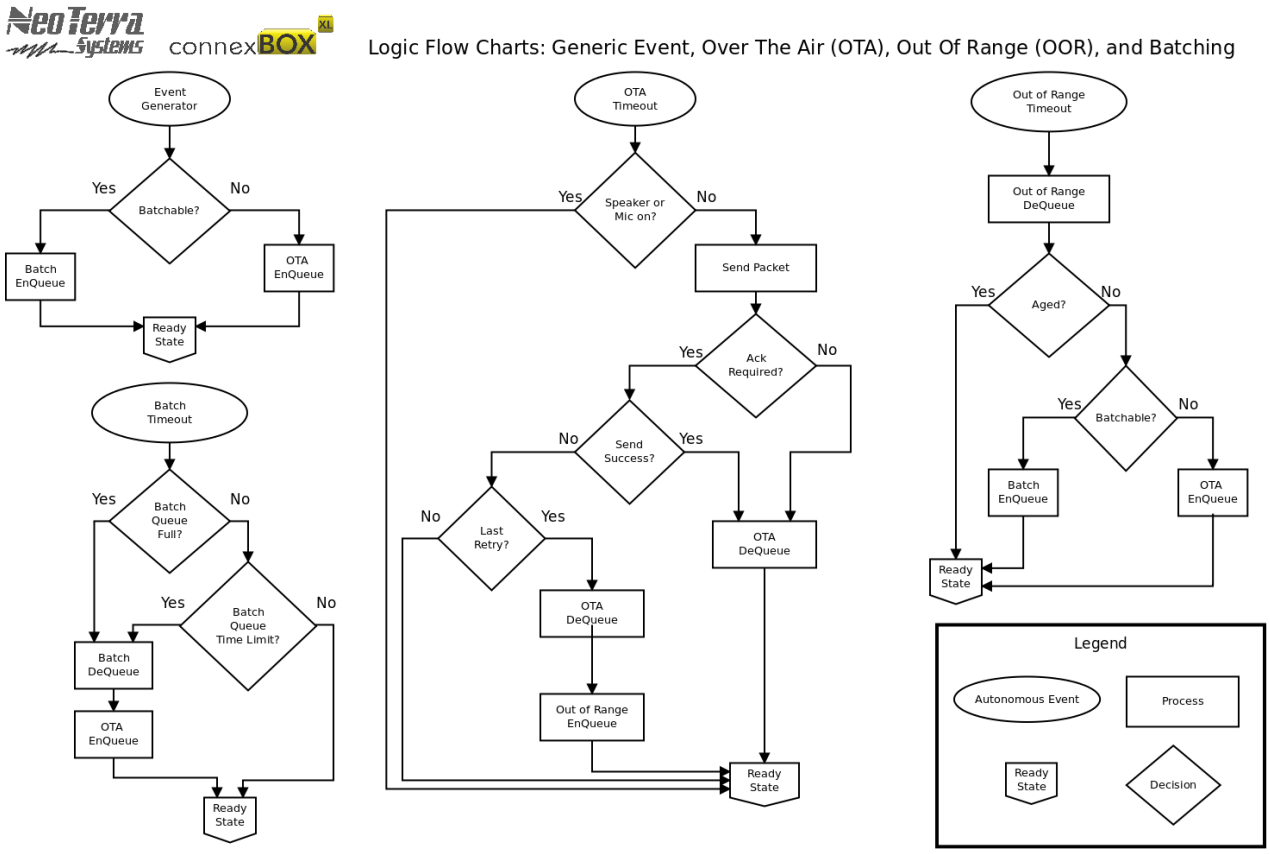
Appendix B

XL Logic Workflow Diagram



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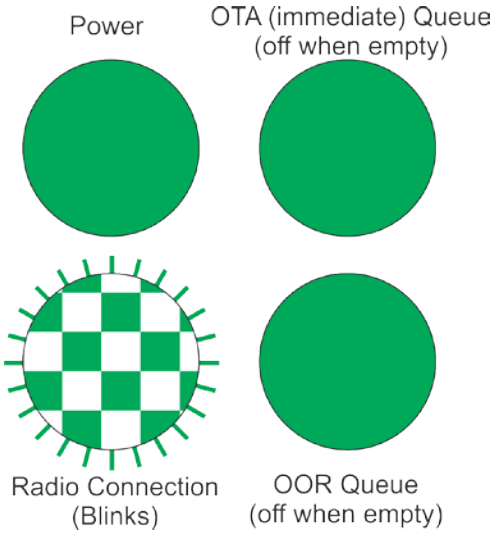
Appendix C

LED Diagram

The grouping of 4 LEDs on the connexBOX XL® is used to display status of the device. This diagram explains the function of each light. These can be used to help diagnose connection issues.



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Notes

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